



OGA / OGV Nordbaden eG Bruchsal relies on Güntner cooling components

The new site of the fruit and vegetable production organisation OGA OGV Nordbaden eG in the industrial zone of Industriegebiet West in Bruchsal is one of the most modern fruit and vegetable logistics centres in Europe. Güntner air coolers and condensers have been used in the new logistics centre since spring 2015 to ensure that the high quality of the sensitive goods is maintained. In the storage rooms, the slight difference in temperature with the Güntner agri coolers ensures a low level of product dehumidification and fluid coolers with flooded evaporation guarantee optimum energy efficiency.

Providing top-quality produce in plentiful supply is the key requirement in the fruit and vegetable retail market. However, each variety of fruit and vegetable has its own individual humidity and temperature requirements and, when stored in a protective atmosphere, will keep fresh for a different amount of time.

In addition to the fact that the solution needed to be environmentally friendly and energy efficient, the concept of being able to quickly change „product-specific“ opera-



Overview

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| Business line: | Industrial refrigeration |
| Application: | Fruit and vegetable cooling |
| Country/City: | Germany/Bruchsal |
| Refrigerant: | NH ₃ , CO ₂ , water/glycol mixture |
| Product: | CO ₂ blast freezer S-CXGHN, CO ₂ air cooler CXGHN, glycol air cooler GGDF, GGHN, GACA FP, dry cooler GHF, condenser AGVH |

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▲ Güntner air coolers and condensers have been used in OGA OGV Bruchsal's new logistics centre since spring 2015 to ensure that the quality of the sensitive goods is maintained.



▲ Apples, asparagus and strawberries are stored under controlled atmosphere in 20 CA and/or ULO (ultra-low oxygen) rooms.



▲ In order to achieve good room penetration, the Güntner air coolers in the 12 °C picking hall are equipped with additional jet nozzles.

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ting parameters for each cold storage chamber was of paramount importance in the planning phase for the new storage area of Bruchsal-based OGA OGV eG.

Natural refrigerants

Since one of the business principles of the cooperative, which was established over 75 years ago, is to ensure sustainable operations, the management board opted to use the natural, efficient and environmentally friendly refrigerants ammonia and CO₂. After all, 5,560 m² of the total surface area of the Bruchsal logistics centre measuring 17,400 m² needs to be cooled.

The Landsberg-based company Frigotec GmbH Kälte- und Verfahrenstechnik, which specialises in the construction of refrigerating plants for fruit and vegetables, delivered, installed and put into operation all the refrigeration, control and regulation equipment as well as the CA/ULO storage equipment for the entire logistics centre.

The German engineering office Brunnenkant from Wiesloch was responsible for the planning, construction management and inspection and approval of the refrigerating plant.

In order to be able to store as many different types of produce and varying batch sizes at the same time, the storage area was divided into 32 small and medium-sized cold rooms. These are cooled via a water/glycol circuit. Güntner air coolers are used in all refrigerated rooms.

Short distances

The internal transport routes for the goods but also the installed supply lines were kept as short as possible and laid out so as to have almost no junctions. The storage rooms are arranged in line with the processing procedure and partly equipped with a humidification system from Frigotec GmbH. This way, the „first in, first out“ storage principle can be consistently implemented in Bruchsal.

Between 90 and 150 employees work at the fruit and vegetable logistics centre depending on the season. The goods are packaged according to each customer's requirements on 17 flexible packaging lines before then being picked. The cooperative's business partners are the major food retail chains as well as specialist wholesalers. 18 truck docking stations ensure that the goods flow in and out smoothly.

Apples, asparagus and strawberries can be stored in a controlled atmosphere (CA) in 20 CA or ULO (ultra-low oxygen) rooms and sweetcorn can be blast frozen. There are also five fast-cooling rooms, four picking rooms, one picking hall and two packing station areas available in Bruchsal.

Energy-efficient operations

In order to reduce cooling-related energy costs, all the drives of the compressor power units and cold and warm brine pumps are fitted with frequency converters to ensure continuous speed control. The fan motors of the Güntner condensers, fluid coolers and air coolers are equipped with EC fans. This means that not just the compressor power units but all other drives are extremely energy efficient too. What's more, the storage area is fully fitted with LED bulbs.

A photovoltaic system installed on the roof of the logistics centre produces power for on-site consumption and covers approx. 30 % of overall power requirements. This type of energy saving has already proven effective in particular in the summer months, when refrigeration requirements are at their highest.

Compared to the refrigeration equipment used at the old site, which also had a lower goods turnover rate, the new logistics centre consumes around 30 % less energy.



▲ Frigotec's measurement and control equipment individually adjusts all operating parameters for each room to the quantities being stored and/or the requirements of the fruit and vegetables in each case.



▲ Three NH₃ fluid coolers with screw compressors and a cooling capacity of 600 kW each are installed for cooling purposes. Two of these units provide cold brine at -11 °C/-5 °C for the cold rooms and one NH₃ fluid cooler provides cold brine at -1 °C/5 °C for the air conditioning.



▲ In the fast-cooling rooms, the cold air flow is directed precisely through the pallet stacks with the help of movable film screens.

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Ammonia used only in the primary cooling circuit

All the refrigeration and supply equipment is installed on the technical floor above the storage rooms. This level houses a closed machine room for the refrigeration equipment. The dry sprinkler system is located on the installation level above the cold rooms. The pressure equalising system of each shielding gas storage room is also located here, which can absorb and emit shielding gas as required.

Three NH₃ fluid coolers with screw compressors and flooded evaporation are available for cooling purposes. Each fluid cooler has a refrigerating capacity of 600 kW. Two fluid coolers refrigerate the cold rooms to -11 °C/-5 °C via a brine circuit. The third power unit air-conditions the picking area to -1 °C/5 °C. The tubing was fully constructed using stainless steel.

The use of flooded evaporation means that there is no need for a minimum temperature difference in the evaporator. As such, small temperature differences and therefore high evaporating temperatures are achieved, especially in the partial load range (long storage phase). This way, the energy losses resulting from the transfer to the secondary cycle are largely offset.

Blast chilling with forced airflow

The respective storage temperature of each of the freshly delivered goods is initially reached in fast-cooling rooms. Five Güntner S-GGHN air coolers each with 100 or 70 kW are used to cool down the goods.

The fast-cooling rooms are able to reduce the core temperature of sweetcorn from 32 °C to 1 °C within 24 hours, for example. Movable film screens direct the cold air precisely through the pallet stacks. This forced ventilation prevents any clusters of warm air from remaining inside the stacks.

Fluid pump-type Güntner AGRI coolers, which are supplied with the cooling medium via the cold brine circuit, are installed in all cold rooms and storage rooms. In partial load operation, these can be regulated much more precisely than direct evaporators. A total of 29 blow-through Güntner AGRI air coolers with blow-through fans are used for the CA/ULO rooms. To ensure continuous control of the brine flow temperature, each room is fitted with its own valve station. Depending on room size, the air coolers have a capacity of between 10 kW and 26 kW.

On account of the minimal difference between the brine temperature and the room air, which can be achieved with the Güntner AGRI coolers, the dehumidification of the stored produce is very low, particularly when it is stored for a long time – relative humidity of up to 98 % can be achieved. The actual relative humidity reached is adjusted in each case depending on the produce or the packaging material used.

Subcritical CO₂ system

Extreme cold, which is provided by a CO₂ system, is required throughout the entire year in the fruit and vegetable storage area. The CO₂ system for the freeze and deep-freeze storage rooms, where t₀ = -35 °C, works exclusively in the subcritical range. It consists of a group of six compressors with a refrigerating capacity of 65 kW each. The condensation heat of the CO₂ cycle is transferred to the water/glycol circuit of the air conditioning via a plate heat exchanger and is dissipated.

A Güntner S-CXGHN blast freezer and five identically constructed Güntner CXGHN CO₂ direct evaporators in two deep-freeze storage rooms are supplied with the CO₂ cooling. The powerful Güntner CO₂ freezer (150 kW) is positioned above the freezing chamber which can accommodate ten trolleys. Air guiding sheets direct the cold air through the frozen goods in order to ensure that the air is evenly distributed through the trolleys containing, for example, sweetcorn cobs.



▲ Two deep-freeze storage rooms are supplied via five Gntner CXGHN CO₂ direct evaporators. Defrosting is carried out via a separate, integrated warm brine circuit.



▲ The CO₂ system (t₀ = -35 °C) works exclusively in the subcritical range and consists of a group of six compressors which each have a refrigerating capacity of 65 kW.



▲ The Gntner condensers have a combined total capacity of 3,100 kW and are grouped together on the roof next to the photovoltaic system.

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Four centrifugal fans without V-belts (maintenance-free) provide air circulation of 112,000 m³ per hour and external pressure of 120 Pa. The coil and tray of the six CO₂ evaporators are defrosted via an integrated brine circuit with warm brine.

Refrigerated picking areas

Unlike the storage rooms which have different climate requirements depending on what produce they are stocked with, the transport and picking areas are constantly cooled all year round to an ambient temperature of 12 °C. A total of 24 Gntner GGHN brine air coolers cool the picking hall, four picking rooms and other areas.

The Gntner air coolers have a capacity of between 15 and 44 kW. They are defrosted as part of circulating air operations. In order to achieve superior air throw, the air coolers in the 12 °C cold picking hall are equipped with additional jet nozzles.

In the sales room, a draught-reduced Gntner GGDF evaporator with a 5 kW refrigerating capacity ensures the right temperature is maintained.

Air conditioning is transported via a separate brine circuit (0 °C/5 °C) to the consumer units in the area for incoming and outgoing goods, the office rooms and the machine room.

Buffer tank for cold and warm brine

The brine circuit for the air conditioning is connected to the brine circuit for the storage rooms via a plate heat exchanger. A 10 m³ buffer tank is integrated for each circuit. This means that in the event of a fault, a redundant refrigerating capacity is available. The usable compression heat from the refrigerating installations is transferred to a warm brine circuit (+55 °C/+45 °C) with a buffer tank and separate pump group.

The warm brine is deployed for defrosting the air coolers for refrigerating within the + °C range and deep freezing. The individual rooms and areas are also equipped with separate fan stations and pumps, which are individually switched in each case for defrosting.

The warm brine also supplies the building's underfloor heating. If no heating capacity is required, a Gntner GFH fluid cooler, with a capacity of 300 kW, cools the 55 °C warm brine to 45 °C.

OGA OGV Nordbaden eG Bruchsal

The cooperative distribution channel OGA OGV Nordbaden eG's range of produce includes asparagus, sweetcorn, strawberries, berries, stone fruits, apples and pears as well as a variety of vegetables and lettuces. The produce is either stored fresh, picked and marketed or processed and frozen.

The fruit and vegetables come predominantly from the northern Rhine valley between the Black Forest and Vosges and the Rhine-Neckar region in south-west Germany but also from other German production areas.

As well as the mild climate and the fertile earth, the approx. 220 production businesses have developed extensive early harvesting techniques so that the cooperative has the first supply of fruit and vegetables from the new harvest for many crops.

The fruit and vegetable logistics centre is certified in accordance with the International Food Standard (IFS), the QS Quality Scheme for Food and the EU Organic Products Regulation.



▲ The extensive tubing, the air socks of the CA/ULO pressure equalising system and the dry sprinkler system are located above the storage rooms.



▲ Güntner brine air cooler with hinged condensation-free trays

Güntner condensers

The non-usable heat, in particular in the storage months, is dissipated via six air-cooled Güntner AGVH ammonia condensers. OGA OGV eG opted for this solution because the condensers only require minimal maintenance and there are no extra costs for water or chemicals.

A total condenser capacity of 3,100 kW is installed. The condensers are grouped together on the roof next to the photovoltaic system and are designed for a maximum ambient temperature of 36 °C.

In order to ensure 100 % operational reliability even in the case of temperature spikes in the summer months, the ammonia condensers were additionally fitted with a spraying system.

Smart control

The individual cold rooms have an extremely different capacity utilisation throughout the year. Therefore, measuring sensors continually check the parameters of air velocity, humidity and ambient temperature in the long-term cold rooms. The storage temperature of the individual cold rooms can be precisely controlled between 0 °C and 10 °C according to the requirements of the produce being stored, with the maximum relative humidity being 98 %.

Up to three air humidifiers per cold storage chamber can increase the humidity in an individual cold storage chamber, if necessary. Temperature sensors on the air coolers ensure need-based defrosting cycles.

The full control of the refrigeration equipment and cold rooms is automated and combined by Frigotec GmbH via a central PLC network. This ensures that all processes are monitored, controlled, regulated and optimised. A decentralised operating unit with touchscreen is installed in each loading aisle so that employees can attend to individual areas quickly and easily.

A centralised control unit is located in the Technical Operations Management office. All data is visualised and can be accessed both internally via a VDU workstation and externally via the Internet. This means that the entire PLC control and PC technology can be accessed remotely. In the event of a fault, this makes operations and troubleshooting easier.

The refrigerating plant has been working to everyone's full satisfaction since the new logistics storage area began operations in spring 2015.